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Participatory Approach for the Integrated and Sustainable Management of the PNVi

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Abstract *— This study proposes an Analysis on the participatory management of Virunga National Park using SWOT analysis. We started from the constant incomprehension and perpetual opposition of the local population on the management of the PNVi. The question asked is to know the management strategy aimed at involving all the actors in the sustainable management of the Virunga National Park. After having presented and analyzed the data of our sample which were provided to us by 3 territories and a city including 12% in the territory of Nyiragongo, 15% in the city of Goma, 22% in the territory of Masisi and 51% in the territory of Rutshuru the size of the sample to be considered in relation to the strategies for involving the population in the sustainable management of the PNVi. The results showed that the best way to generate the PNVi would be the integrated management model, at least 42% of study participants proposed it, 31% proposed the multi-agent model, 20% proposed the traditional model policeman and 7% suggested private management.*

Keywords *— **Management, National Park, Degradation, Biodiversity, local participation, Riverside Population.***

I. INTRODUCTION

Biodiversity degradation poses a threat to the future conservation of protected areas (Doumenge et al., 2021). The idea of restoring forests for ecological reasons and the conservation of biodiversity is recent. Deforestation has a local impact on biodiversity: it reduces the areas suitable for habitat, modifies the configuration of the landscape, and fragments forest areas (Piker et al., 2016). This fragmentation produces physical edge effects, changes in composition, species structure and isolation that results in loss of connectivity (Kambale et al., 2016).

The Virunga National Park (PNVi), a link in the Congolese network of protected areas, is rich in biodiversity but one of the most threatened in the Democratic Republic of Congo, with population growth, poaching, illegal fishing, agriculture, charcoal cutting and exploration for oil exploitation and animal grazing (Habiyaremye et al., 2020). It is located in a country in constant war, because from the 1960s until today, the Congo has entered into cycles of repeated violence. First by coups, the dictatorship, then by repeated rebellions; among others the war of liberation of 1996 completed by the war of rectification of 1998-2003 and currently the pockets of resistance of the local and foreign militias. Note that the rear base of most of these rebellions is located in the Virunga National Park.

The biodiversity of the PNVi, which is of paramount ecological and socio-economic importance for the populations of the DRC, is unfortunately the subject of very extensive degradation threatening certain endemic species with extinction under the combined effect of the disorder of these bands. armies operating

in said park. In this region, forestry and agro-forestry systems have frequently been disrupted by changes in land use which are even at the root of armed conflicts in the region. The economic stakes are higher than ever, firstly by the geographical position of the Park which is on the border of the two countries of East Africa with intense cross-border exchanges; but also by the production of charcoal which has become a lucrative activity. The reasons are varied: participation in the activities of armed groups, poaching (cutting up or transporting meat), illegal agriculture (invasions). Appropriate modes of management would be those that obey the notions of grassroots democratization, political liberalization and collective empowerment. Indeed, the current approach that was practiced in the management of the PNVi shows its limits. There is no regulatory mechanism that has not been circumvented (Karsenty et al., 2014). Thus, the participatory approach is presented as one that can bring out new regulations based on the dynamics of consultation, co-decision and co-management while respecting gender. Approach whose real objective is to find a way to preserve the beauty of landscapes, as well as ecosystems and biological diversity, while ensuring that the protected area contributes as much as possible to the well-being of the populations who live there or that are nearby (Grange, 2012).

1.1 Effectiveness of the participatory approach

Traditional management approaches tend to be sectoral, considering individual ecosystem components in isolation. This has often resulted in poor decisions, conflicts over space and resources, environmental degradation and economic loss. Conversely, the landscape approach considers our activities as part of a single system, in which all sectors are integrated, which makes it possible to determine and manage the general consequences of decisions (Sayer, 2013)

Scientists and managers of protected areas agree that, to be more effective, conservation planning must be designed on a large scale: entire ecosystems, ecoregions and terrestrial and marine environments representing ecological units. The participatory approach is the appropriate scale for defining priority biodiversity sites and ecological functions requiring protection, as well as for choosing sites, delimiting them and defining management needs. It makes it possible to better assess the threats emanating from the social, political and economic context, as well as the means to mitigate them, and provides a framework for cross-sector and multi-jurisdictional partnership to address complex environmental issues (Doumenge, 2021).

In addition, protected areas are very useful to scientists as an ecological baseline to better understand the functioning of ecosystems and biomes where the impacts of human activities are excluded or minimized. This knowledge is used both for the management of the system itself and for the development of sustainable development plans outside protected areas. They will also increasingly contribute to developing adaptive responses and to strengthening the resilience of ecosystems in the face of climate change.

1.2. Presentation of the study area

1.2.1. Geographical and administrative location

Study environment

Located in Central Africa, the Democratic Republic of Congo, with an area of 2,345,000 km², is the second largest country in Africa after Algeria. It is located between 12°10' and 31°21' East longitude and between latitudes 5° 25' North and 13° 28' South (PAG Report, 20 20). Figure 1.1 shows the landscape map of Virunga.

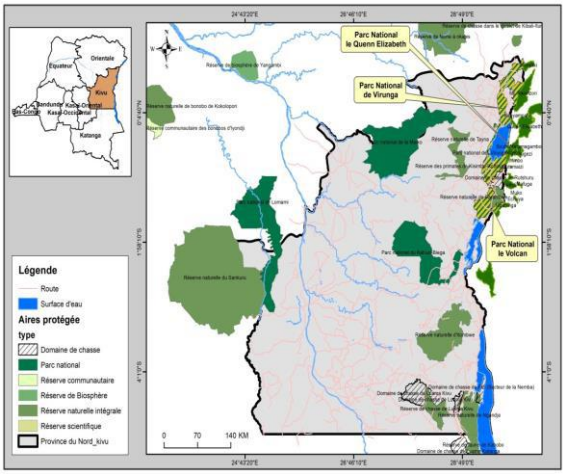

Fig.1. 1 : The Virunga landscape

The Virunga National Park is located in eastern DRC in the province of North Kivu, along its borders with Rwanda and Uganda. Covering an area of 784,368 ha, it has a very elongated shape along a North-South

axis and straddles two large watersheds, the Nile and the Congo. It is limited to the North-East by Uganda through the Queens Elizabeth National Park and to the South-East by Rwanda through the Volcano National Park which extends it to Tanzania and Burundi, it is a main element of the landscape. which is in this region. The PNVi is almost entirely (98.83%) located in the province of North Kivu, but the extreme North (1.13%) is in the Eastern Province in the territory of Irumu, and Tshegera Island (48 Ha) in the northern part of Lake Kivu in South Kivu Province, Kalehe territory. From South to North, there are 4 bordering territories (Nyiragongo, Rutshuru, Lubero, Beni). These territories are subdivided into chiefdoms, groups and localities with several urban cities such as those of Rutshuru, Kiwanja and Lubero. Three large cities are located on the immediate periphery of the park: Goma, Beni and Ruhengeri in Rwanda (environment division, 2022).

1.2.3. Biophysical environment

1.2.3.1. Climate

There is no characteristic climate for the entire park, but a multitude of microclimates. The sunniest and least rainy site in the DRC, Ishango, is 60 km from the least sunny and rainiest site, Ruwenzori, at around 2,700 m altitude (PAG, 2020).

Due to its position on the equator, the PNVi quite typically experiences a regime of two dry seasons and two rainy seasons, with strong local variations in total precipitation, but relatively little variation in the seasonal regime. The dry seasons are relatively inconspicuous, both in the plains and in the mountains, the months without any rainfall being exceptional. The review of monthly rainfall for the main stations of the park shows a peak in rainfall in April-May and September-October, and minimum rainfall in February and July.

1.2.3.2. Geomorphology

The PNVi is bordered by three mountain ranges: the Mitumba range to the West, the Ruwenzori range to the North-East and the Virunga range to the South. The Virunga massif includes 6 extinct volcanoes, four of which are partially or entirely in the DRC: the summits of three of them (Karisimbi: 4,507 m, Visoke: 3,711 m, and Sabyinyo: 3,634 m) delimit the border between the DRC, Rwanda and Uganda, and the Mikeno (4,437 m) is entirely in the DRC. To the west of this chain of relatively extinct volcanoes are the two active volcanoes: Nyiragongo (3,470 m) and Nyamulagira (3,056 m). In the Center sector, the Kasali mountains emerge to the south of the Rwindi plain.

1.2.3.3. Relief and topography

The relief of North Kivu where the PNVi is located is very rugged. The altitude varies from less than 800 m to more than 2,500 m. Some peaks reach over 5,000 m. This relief is made up of plains, plateaus and mountain ranges. The alluvial plains extend from north to south of Lake Edward. These are, respectively, the alluvial plains of Semliki and Rwindi-Rutshuru. The western shores of Lake Edward come up against a steep escarpment, the extension of which to the south, bordering the Rwindi-Rutshuru plain, is known as the Kabasha escarpment. The alluvial plain of the Semliki is tightened between the northern extension of the shoreline escarpment of Lake Edward to the west, and the imposing massif of Ruwenzori (5.119 m) to the east. The Rwindi - Rutshuru plain rises slowly, but very regularly towards the South, where it collides with the lava fields which linked it to the Virunga massif, and particularly to the group of active volcanoes dominated by Nyamulagira (3,056 m) and the Nyiragongo (3,470 m) (PAG, 2020). Figure 2.2 presents an image of the character of the relief in the western part of PNVi.

1.2.3.4. Soils

The altitude climate and the relief give the soils of North Kivu a certain complexity. We could nevertheless divide the soils of North Kivu into three major classes. First, recent volcanic soils from lava flows from volcanoes. Recent flows do not yet allow agriculture to settle there, while in older flows, the lava is particularly decomposed and forms a soil that is sometimes still superficial, but very fertile. These soils are found between Goma and Rutshuru. Then the soils of the alluvial plains. These soils are found in the plains of the Semliki and come from lake deposits, the Semliki River and its tributaries. Finally the soils of ancient rocks. They are very deep and rich in humus. They are quite clayey and not very compact and have, on the surface, a large reserve of organic matter (Schulz et al., 1981).

1.2.3.5 Vegetation

The main types of vegetation in the province of North Kivu are:

- The dominant savannas in the alluvial plains of Semliki and Rutshuru.

- Shrubby and forest sclerophyllous climatic formations in the lava plain North of Lake Kivu. The mountain rainforests are mainly observed in the Ruwenzori and Virunga massifs. These forests are heterogeneous. Figure 2.3 presents an image of the vegetation character in the Northern part of PNVi.

1.2.3.6. Hydrography

The PNVi watershed contributes to the two major watersheds of the continent, the Nile and the Congo. It is drained by a dense network consisting in particular of:

- The rivers, the main ones being the Rutshuru, the Rwindi and the Ishasha, which flow into Lake Edward;

- The Semliki, outlet of Lake Edward to Lake Albert, receives the waters of many tributaries;

- Lake Edward and other inland lakes such as Tshabuganga, Hondo, Kibunga and Molindi lakes in the Rutshuru basin;

- The high altitude glaciers, lakes and marshes of the Ruwenzori Mountains;

- The muddy ponds of the Rwindi plain and the Mikeno sector (Nyirandizima, Mpororo and Gikere);

- The thermal waters of the South of the Rwindi plains.

1.3. SAMPLING

A total of 430 people were surveyed, of which 418 were subjected to a semi-structured questionnaire and 12 to structured questionnaires. Figure 1.3 shows the percentage of respondents by territory.

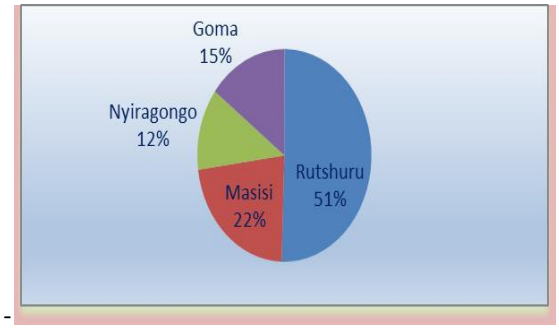

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Fig.1.3: Distribution of respondents by territory

This figure N°1.3 shows that more than half of the people surveyed, ie 51%, come from Rutshuru territory. Then, 22% of respondents come from Masisi against 15% who are from the City of Goma. Finally, 12% come from the territory of Nyiragongo. Figure 1.4 gives the distribution of respondents by groupement/district.

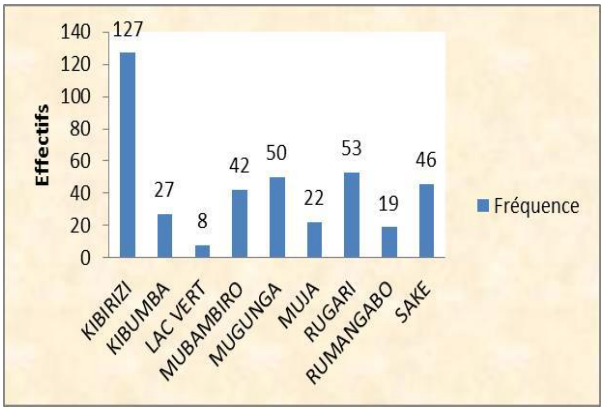

Fig.1.4: Graph representing the origin groupings of respondents.

From this graph, we understand the villages of origin of the respondents.

1.5. Collection of data on the analysis of constraints and opportunities for the implementation of the Participatory Approach in the protection of the PNVi

Constraints and opportunities were analyzed based on information obtained during focus groups carried out in the field, added to the structured and semi-structured questionnaires sent to the target people during the interviews. To bring out the scales of a qualitative analysis, a compilation analysis of several threat reports on the PNVi and a SWOT analysis made it possible to highlight the strengths, weaknesses, opportunities and threats that the stakeholders have for the promotion of the Participatory approach in the protection of the PNVi.

For the identification of constraints and opportunities, direct observations in the field were carried out, added to the structured and semi-structured questionnaires addressed to the people in the focus groups and an interview guide addressed individually to the local authorities and the local people who were used for this purpose. To take the scales out of a qualitative analysis, we did a compilation analysis of several threat reports on the PNVi and finally a SWOT analysis made it possible

to highlight the strengths, weaknesses, opportunities and threats that the stakeholders have for the promotion of the Landscape approach in the protection of the PNVi.

II. RESULTS

2.1. Analysis of strengths, weaknesses, opportunities and threats (SWOT)

The results of the SWOT analysis of PNVi management are presented in Table 3.23. It emerges from this table that co-management with stakeholders is only possible if the strengths, weaknesses, opportunities and threats mentioned below are taken into account and exploited. To do this, stakeholders must be integrated.

The study showed that:

- The advantages for the integration of stakeholders in the implementation of the Participatory Approach of the PNVi far outweigh the constraints, provided that there is a real political will on the part of all stakeholders to change the current classical management system.
- The involvement and empowerment of stakeholders in the co-management process is essential in order to control the degradation of natural resources.
- The combination of efforts and diverging interests of the actors involved in the co-management process of the PNVi is very useful for halting the degradation of natural resources.
- Stakeholders are the basis for acceptance of sustainable development. Therefore, a

development is qualified as sustainable when it meets the needs of local communities.

Co-management with stakeholders is perceived at the level of the PNVi as an innovative structure for the management of natural resources. It is considered as the only solution to overcome the conflicts of the actors. However, this co-management is not without problems, but it is not impossible either. If nothing was done, the situation would get worse. The analysis of the Strengths, Weaknesses, Opportunities and Threats (SWOT) matrix yielded results following the exploration of the interview guide, the focus group conducted with the actors and the exploitation of the administrative documents. The PNVi has strengths. Indeed, its legal recognition, and that of the management bodies, the establishment of an annual operating budget, the support and accompaniment of conservation NGOs (Biodiversity Project, allow it to implement a certain number of actions in accordance with the objectives of creation meeting the needs of conservation and development. However, weaknesses are to be noted and are summarized in the absence of involvement of local communities in the management, the absence of their own financing, the communication deficit.

2.3. Constraints of the implementation of the participatory approach in the protection of the PNVi according to the respondents

Table 2.2 presents the constraints and opportunities for implementing the landscape approach in the PVNi.

2.1.1. Threats to the implementation of the participatory approach in the PNVi

The various threats that weigh on the whole of the PNVi constitute real obstacles to the implementation of the landscape approach in the management of the PNVi. Tables 3.29 and 3.30 present the direct causes of threats to different parts of PNVi according to Mastaki (2016).

Table 2.1: SWOT analysis of PNVi management

FORCES	WEAKNESSES
• Existence of an institutional framework. • Existence of the legislative framework. • Availability of a regulatory framework • Availability of a park development plan • Structuring for development (Associations and Groups…) • Existence of a partnership at different levels (Ministry of the Environment) • Impressive number of eco-grades	• Weak law enforcement • Lack of involvement of the population in the management of natural resources. • Weak financial contribution from the State in the project to decentralize the management of natural resources. • Insufficient communication between stakeholders and park managers. • Diversified strategies of local NGOs for the management of natural resources. • The non-existence of synergies between the activities carried out by the NGOs on site • Inadequate and poor condition of infrastructure; • Insufficient funding for anti-poaching activities • Lack of equitable sharing of the benefits of the park • The weak scientific research allowing the adaptation of land management
OPPORTUNITIES	**THREATS**
• The presence of various donors and NGOs involved in the field of sustainable management of natural resources: Technical and financial support (COPEVI, PEVI-KACHECHE, LODE, CCC AND COCOSI) • Recognition of the environment sector by the public authorities as a priority sector • The existence of an environmental policy and framework law on the Transfer of Natural Resource Management (TGRN) • The emergence of the collaboration of Development Agencies to work together.	• Deforestation and climate change • Chronic poverty and lack of economic alternatives • Population growth • Armed conflicts • Lack of grazing outside the park • The persistence of poverty throughout the periphery of the PNVi • Oil exploration/exploitation in the park region • Ignorance of the law • Failure to respect the buffer zone around the park

Table .2.2: Threat in the northern part of PNVi

THREATS	DIRECT CAUSES
Encroachment for agriculture • Lubiliya • Mayangose/Mavivi • Kyavinyonge • Tshiabirimu • Kanyatsi	Weakness of the law, Land request Displacement of the population due to insecurity, Unemployment Overcrowding, Political campaign
Pasture • Karuruma	Political facts
Armed poaching • Savannah • Lowland forest	Presence of armed groups Presence of bandits
Collection of firewood • Mavivi	Alternative to trade following the fall in the prices of industrial crops (coffee and papain)
Carbonization • Lubiliya, Kyavinyonge, Mavivi	Weakness of law, commerce
Illegal fishing • Lac Édouard	Weakness of the law and non-application of the convention concerning fishing villages
Dwellings in the park • Lubiliya • Kyavinyonge	Weakness of the law Land request
10. Wildfire– Karuruma	Pasture development
Living animals Traffick	High demand

Table 2.3: Pressure and threats in the parts: Center, South and East

Pressures and threats	Direct Causes
Encroachment/housing facilities	• Population movements • Land request • Absence of ICCN
Presence of pastures Ex: Mikeno and Kirolirwe	• Population movement • Demand for land for pasture
Armed poaching	• Presence of soldiers and militias • Arms proliferation • Trade

Traditional poaching	• Subsistence need
Crop degradation	• Pressure in the park causing the movement of animals outside • Absence of the buffer zone • Lack of appropriate management strategies
Collection of construction wood	• Non-enforcement of the law • Increase in population in fishing villages
Uncontrolled bush fires Ex: Sarambwe	• Poaching • Uncontrolled population movements • Lack of appropriate management strategies
Weak ICCN capacity (indirect threat)	• Political crisis • Lack of funding
Weak community involvement (indirect threat)	• Lack of strategies • Little funding

These tables show that the PNVi is threatened by the effects of the war. Evils such as institutional vulnerability, destruction of infrastructure, illegal arms circulation, poverty and illegal human settlement in the park, as well as other issues like commercial and subsistence poaching, are the main threats experienced by the PNVi, a World Heritage site for a decade. The existence of the active volcano " Nyiragongo " within the park, whose last eruption took place in May 2021, is also considered a threat to the sustainability of PNVi.

2.1.1.1. The problems of the PNVi

The lack of understanding of the population regarding the interests they gain by protecting the park is a major problem that hinders awareness-raising initiatives on conservation at the level of the PNVi. This divergence in the point of view is to be overcome by concrete actions such as the electrification of nearby areas which was carried out by Virunga Sarl.

2.1.1.2. International zoning standards

The textual data shows different correspondences, reports and minutes that simultaneously explain disputes between the population and ICCN on the non-participatory approach with which the PNVi is managed. Although international zoning standards are not popularized within local organizations, the sacrosanct principle of participation within the limits remains known to all. The PNVi sheltering the mountain gorillas, star species of all the parks in the world, the socio-economic importance manifests itself not only at the local level, but especially at the national and international levels which have the interests to be shared at several levels including the nobler is the community level.

2.5. Management approaches developed to address these issues

This management approach is centered on the organization of consultation meetings between the actors, the results show that sometimes the ICCN organizes joint meetings. But what is useful are the results of consultations with local organizations that can play a key role in risk reduction and sensitize local communities on the interest of protecting our forests in the context of protecting the basin of the Congo. The thematic analysis shows that a participatory management approach by stakeholders will help reverse the trend and increase people's understanding of the self-management of protected areas in our country.

Consultation meetings for the resolution of conflicts are usually organized but do not lead to a conclusion and generally in the event of resolution, the recommendations made are not respected according to the local population.

. From these analyses, the proposed management system that could help the sustainable protection of PNVi and contribute to the promotion of PNVi is presented in Figure 2.1

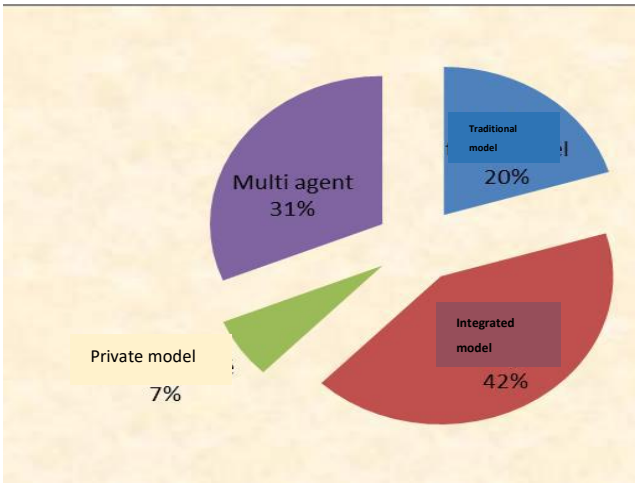

Fig.2.1: Illustrative diagram of the management system that will assist in the protection of PNVi

This diagram shows that the majority of respondents, 42%, mention the integrated model as a management system that would help protect the PNVi for the future against 31% who raise multi-agent simulation. Then, the traditional model is mentioned at 20% against the private model at 7%.

2.4. Opportunities to be seized to promote the landscape approach according to respondents

Table 2.4: Distribution of opportunities to be seized according to respondents

Opportunities to seize to promote the landscape approach	Frequency	Percentage
Tourisms	9	2,3
Planting trees in the park	7	1,8
Information	10	2,5
Free entry into the park for anyone	6	1,5
Bring order to the country	4	1,0
Civil Society Organizations including local NGOs, Churches, Schools.....	252	64,0
Park boundaries with neighboring countries, NGOs,	22	5,6
International or local NGO	61	15,5
Road access to go abroad	5	1,3
No opportunities	8	2,0
Neighboring countries including Rwanda and Uganda	10	2,5
Total	394	100,0

This table shows that 64% of respondents list civil society organizations including local NGOs, churches and schools as the first opportunity to seize for the promotion of the landscape approach. 15.5% of respondents speak of international organizations. Then, 5.6% evoke the limits of the park with neighboring countries as an opportunity to be seized for the promotion of this approach against 2.3% who raise the planting of trees in the park. Also, 2.3% mention neighboring countries including Rwanda and Uganda. Finally, the others show that there are no opportunities, a minority evokes the access to roads to go abroad (1.3%) and another minority suggests that it is first necessary to put the order in the country (1%).

2.5.1. Prospects for the sustainable promotion of the participatory approach in the PNVi

2.5.1.1. Raising awareness on the protection of protected areas

The previous results showed that the populations are not sufficiently informed about the P NVi management activities that can contribute to its protection. As a result, one of the prospects for the sustainable promotion of the landscape approach in the management of the PNVi is the awareness of the local populations and the following figure 3.27 shows the proportion of respondents made aware of the notions of protection of the PNVi.

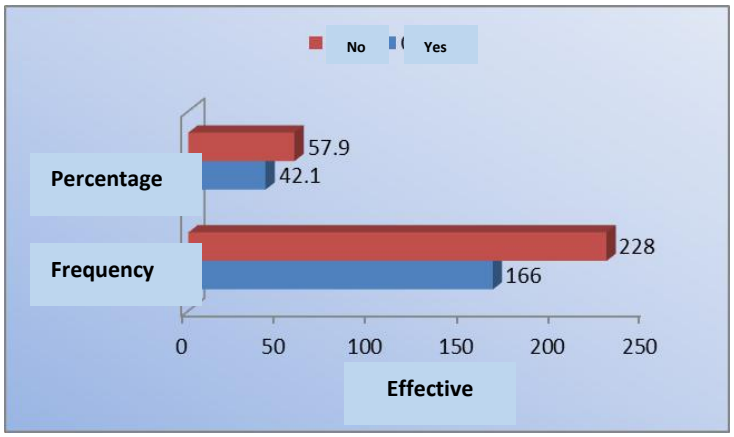

Fig.3.27: Sensitization on the protection of the PNVi

This figure shows that 57.9% of respondents were not made aware of the protection of the PNVi against 42.1% who were made aware.

Table 2.5: Logical framework for participatory management of the PNVi

Intervention logic		**Objectively verifiable indicators**	**Sources and means of verification**	**Hypotheses**
Global objective	Propose axes to minimize the obstacles to the implementation of the participatory approach in the PNVi and suggest a sustainable management model.	• 90% of the population will be informed about the consequences of the degradation of the PNVi • The local population is resolutely involved in the protection of the biodiversity of the PNVi	•Awareness Report • Survey sheet • Expert report Structure Documentation	•Will of the authorities in charge of managing the PNVi •Availability of the calendar of activities •Commitment and collaboration of local populations
Specific objective 1	**Ensure the integrated and sustainable management of the PNVi**			
Activities to be carried	• Establish a diagnosis of the vulnerability of populations and	• The grouping of the population into vigilance	• Vigilance committee plan report	

out	their property • Creation of vigilance committees around the PNVi in collaboration with the ICCN	committees	• Status of Vigilance Committees
Specific objective 2	**Improve the living conditions of local populations**		
Activities to be carried out	• Respect the standards relating to land use around the PNVi • Use organic fertilizers for agricultural practices outside the PNVi	• Reduced pressure on the PNVi	•Report of the provincial division of environment
Specific objective 3	**Ensuring the sustainable management of State heritage**		
Activities to be carried out	•Ensure compliance with regulations relating to environmental management • Comply with environmental laws	• Environmental Management Plan	• Report of other actors • Field descent report
Specific objective 4	Promote collaboration tween actors		
Activities to be carried out	•Encourage people to organize themselves into a common initiation group • Raising awareness of the populations on the best agricultural techniques and self-care without looking at the PNVi • Transmit the grievances of the local populations to the managers of the PNVi and the state	• High number of self-help by the local population • 70% of the population master good agricultural practices Degree of satisfaction of Riverside Populations	•Statistical report on the population's perception of the PNVi

III. CONCLUSION

The objective of this study was to contribute to the integrated management of the Virunga National Park and its periphery through the analysis of the determinants of the promotion of the Participatory approach. This was done initially through an assessment of the state of the forest cover of the PNVi over 30 years, then through a critical analysis of the current mode of governance of the PNVi, followed by the evaluation of the perception of different actors on the management mode of the park and the sustainable protection of the forest biodiversity of the Congo Basin, the constraints and opportunities for the implementation of the landscape approach in the PNVi and finally, an analysis of the strategic axes and perspectives sustainable promotion of the landscape approach in the PNVi. The forest resources of PNVi are subject to many pressures. The results reveal that the landscape of PNVi has changed a lot in 30 years. The forest cover there increased from 443,005.31 hectares in 1990 to 221,387.51 hectares in 2020. These changes are mainly due to disturbances of anthropic origin, mainly agriculture and demographic pressure. The annual deforestation rate is higher than the current national average.

IV. RECOMMENDATIONS

1.1. At the state level

- Develop and implement a PNVi management program integrating the local community and

ICCN agents;

- Integrate new mechanisms for financing protected areas in its biodiversity conservation

policies (REDD…);

- Encourage the creation of trust funds for conservation based on successful experiences

(Madagascar, Mauritania,);

- Update the regulatory framework that organizes the conservation of biodiversity in the

PNVi;

- Put in place legislation adapted to the establishment of sustainable financing mechanisms

(vote of law allowing the retention of revenue or creation of taxes which must be paid

directly to the PNVi).

- Encourage the activism of local populations in natural resource management groups.

REFERENCES

[1] Amadou b, 2006. Analysis of the dynamics of space occupation and impacts on ecosystems. Study of population growth in the Biosphere Reserve of W Niger, Rap, UNESCO/MAB-UNEP/GEF.

[2] Doumenge, C., Palla, F., Madzous, I., & Ludovic, G. (2021). Central African Protected Areas–State 2020

[3] Grange, B. (2012). The landscape approach for action strategies to optimize the conservation and restoration of a threatened ecosystem: Example of the dry forest of New Caledonia (end-of-study dissertation-Engineering diploma from the Higher Institute of Agronomic, Agrifood, Horticultural and Landscape Sciences) Nouméa: Center of Angers National Institute of Horticulture and Landscape. Government of New Caledonia, CEN Dry Forest Pole, WWF

[4] Habiyaremye, f. M, S. K. (2020). Environment and endogenous pillars of biodiversity enhancement in the southern and central sectors of Virunga National Park, DR Congo. Geo-Eco-Trop, 44(1), 15-41

[5] Kambale, J. L. K., Shutsha, R. E., Katembo, E. W., Omatoko, J. M., Kirongozi, F. B., Basa, O. D., ... & Ngbolua, K. T. N. (2016). Floristic and structural study of two mixed plant groups on hydromorphic and firm soil of the Kponyo forest (Bas-Uélé Province, DR Congo)). International Journal of Innovation and Scientific Research, 24(2), 300-308.

[6] Lalouvière, N. D. (2021). Conceptualizing "common cultural landscapes": reconstructing the evolution of ecological thinking, from studies of the Swiss Alpine landscape to socio-ecological systems. Journal of Alpine Research | Journal of Alpine Geography, (109-1).

[7] Lubala, E.B.B., Mumbere, J.C., Masirika, J.M., Kujirakwinja, D., Shamavu, P., Muhind, E., ... & Micha, J.C. (2018). Production and impacts of fishing in the Congolese part of Lake Edward. Tropicultura, 36(3), 539-552.

[8] Sayer, J., Sunderland, T., Ghazoul, J., Pfund, J. L., Sheil, D., Meijaard, E. ... & Buck, L. E. (2013). Ten principles for a landscape approach to balancing agriculture, conservation and other competing land uses. Proceedings of the National Academy of Sciences, 110(21), 8349-8356

[9] Pirker, J., Mosnier, A., Kraxner, F., Havlík, P., & Obersteiner, M. (2016). What are the limits to oil palm expansion? Global Environmental Change, 40, 73-81.